REMARKS

The following remarks are responsive to the Office communication, dated February 2, 2007, wherein pending Claims 1-19, 22 and 23 were rejected.

The pending claims are Claims 1-3, and 22-33.

Claims 4-20 are cancelled.

Claim 1 is amended.

Claims 24 - 33 are new.

Support for the claims as amended is explained below. No new matter is introduced by the amended or new claims.

Each of the Examiner's objections and rejections to the previously pending claims is discussed separately below.

In view of the above amendments and below remarks, Applicants respectfully submit that the application and now-pending claims are in condition for allowance.

Support for the Amendments to the Claims

The rejected Claims are now amended to reflect the election of the species subject to the rejection requirement of the Examiner, which is compositions having pentafluoroethane, 1,1,1,2 –tetrafluoroethane and isobutane.

Claim 1 is amended to recite component (a) in an amount of from 83-88% is supported at paragraph [0017]; component (b) in an amount of from 7.5-15% is supported at paragraph [0018]; isobutane is recited in paragraph [0020], line 7.

Claim 24 is supported at paragraph [0017], line 5.

Claim 25 is supported at paragraph [0018], line 4.

Claim 26 is supported at Table 1.

Additional component (d) of Claims 27, 30, 32, and 33 is supported at paragraph [0021], lines 8-12.

Support for the lubricant and additives components of the new claims is found at paragraphs [0022] and [0023].

Double Patenting

Applicants submit that the above amended claims avoid the obviousness type double patent rejecting. Thus, no terminal disclaimer is included herewith and none should be required. Applicants request that this rejection be withdrawn.

35 U.S.C. § 102(b)

The Examiner rejected Claims 1-19, 22 and 23 under 35 U.S.C. § 102 (b) as being anticipated by Roberts, European Conference (June 2005) (the "Roberts publication"). Applicants respectfully traverse this rejection. In particular, the Roberts publication, by virtue of is 2005 publication date, is not available as prior art to above referenced pending application, which enjoys the benefit of a PCT filing date of October 13, 2003, which in turn is based on an earlier October 22, 2002, priority document. Thus, Applicants submit that this rejection should be withdrawn.

35 U.S.C. § 103(a)

The Examiner rejected Claims 1-19, 22 and 23 under 35 U.S.C. § 103 (a) as being obvious over the Roberts publication and WO 01/23493 (the '493 reference). Further the reasons discussed below, Applicants respectfully traverse these rejections.

With respect to the Roberts publication, for the reasons explained above, Applicants submit that this reference is not prior art and the rejection should be withdrawn.

With respect to the '493 reference, Applicants submit that there is no teaching, suggestion, or any motivation of any kind to select or achieve the now claimed invention in view of the full disclosure of the '493 reference. There are many reasons that the rejection of based on the '493 reference should be withdrawn.

In particular, the specific ranges of mixtures as now claimed do not overlap with any part of the broad disclosure of the '493 reference And, the '493 reference actually teaches away from successfully selecting the claimed compositions having specific ranges of mixtures of R125, R134a and R600a in the now presented independent claims, including explicit teachings away from selecting isobutane.

Thus, Applicants respectfully disagree with certain aspects of the Examiner's characterization of the '493 reference and disagree with his conclusion that, in late 2002 one of ordinary skill in the field of refrigerant formulation, would have understood from the '493 reference to formulate a composition having 1-4 weight % isobutane, 83-88 weight % R125, and 7.5-15 weight % R134a. In short, the '493 reference fails to teach, suggest or motivate the selection or achievement of the compositions recited by the amended claims.

There are Too Many Possible Formulations Within the '493 Reference's Disclosure to Suggest the Compositions Now Claimed.

In short the number of possible different formulations that could have been created from the '493 reference is many tens of thousands of different blend combinations. This a number too large to motivate one of ordinary skill in the art to select a narrow range of compositions within the broad range of 50-80% pentafluoroethane with 20-50% tetrafluoroethane and over 17 different hydrocarbons, let alone to make the selections of the now amended claims (which are outside of the broad possible ranges noted by the Examiner at paragraph 13 of the February 2007 Office communication).

The '493 Reference Explicitly Teaches that Isobutane is not an Acceptable Hydrocarbon

Even if one of ordinary skill in the art of formulating compositions had unlimited resources (money, infinitely powerful computers, lab personnel, time, equipment, materials), the '493 reference does not teach the use of isobutane (despite the recitation of 2-methyl propane). Indeed, the '493 reference teaches away from the use of isobutane in refrigerant formulations. Thus, when the large number of possible refrigerant formulations is juxtapositioned with the explicit teachings of the '493 reference, one of ordinary skill would never have been taught to use isobutane in the timeframe of circa 2002.

The explicit teachings and fair suggestions of the '493 reference are to create a refrigerant composition that includes a saturated hydrocarbon or mixtures of hydrocarbons selected from those "boiling in the range of -5 °C to + 70 °C." *See, e.g.,* the '493 reference at the Abstract (front page); page 3, line 3; and Claim 1 at p. 18. Moreover, the '493 reference states that the hydrocarbon additive preferably has a boiling point in the range of 20°C to 40°C. *See* the '493 reference at page 4, line 4. Isobutane has a boiling point of -11.7°C.

Thus, it appears that the inventors named on the '493 reference erroneously listed 2-methyl propane in the list of hydrocarbons that they believed boiled at temperatures between -5 °C to + 70 °C.

Indeed, all of the saturated hydrocarbons listed in the '493 reference (with the sole exception of 2-methylpropane) have a boiling point well above the lower boiling point limit of – 5.0°C. The fact that the '493 reference inventors expanded the recited lower end of range to -5.0°C from the boiling point of -0.5°C of butane, is evidence to one of ordinary skill of a deliberate decision to exclude all hydrocarbons boiling lower than the -5.0°C. Viewing the named inventors of the '493 reference as knowledgeable in their field, the inclusion of 2-methyl propane appears to have been an inadvertent error.

Also, the only butane mentioned outside of the list at page 4, is the use of the word "butane" (which means n-butane, not isobutane, to one of ordinary skill in the art a shown in the attached Exhibit A) and then in mixtures with a pentane. Table A, below, lists the hydrocarbons considered by all of the Examples reported in the '493 reference with their respective boiling points.

Table A

Hydrocarbons Used in Examples of the '493 Reference

Example	Hydrocarbon(s)	Boiling Point
1	4% pentane	36°C
2	4% pentane	36°C
3	4% pentane	36°C
4	4% pentane	36°C
5	4% pentane	36°C
6	4% pentane	36°C
7	2% pentane	36°C
	1% isopentane + 2 % n-butane	28°C & -0.5°C

The selection of the n-pentane and iso-pentane in the '493 reference Examples indicates that these inventors believed that the middle of the -5 °C to +70 °C range was likely to produce the fruitful area of investigation. That the middle of the -5 °C to +70 °C range is where the '493 reference believes the best compositions could be formulated and is explicitly stated in the '493 reference at page 4, lines 4-7:

> Use of n-pentane, cyclopentane, iso-pentane and mixtures thereof is preferred. Use of n-pentane, isopentane and mixtures thereof is especially preferred.

All three of the pentanes mentioned above have boiling points at temperatures in the middle portion of the recited -5 °C to +70 °C range, at +36°C, + 49, and +28°C, respectively.

Thus, Applicants submit that the totality of the teachings of the '493 reference is that it teaches away from using a hydrocarbon having a boiling point below -5°C. At best, the '493 reference teaches that if n-butane (b.p. -0.5°C) is used, it should be mixed with isopentane. There is nothing in the '493 reference that teaches or suggests that isobutane would be useful alone, or in combination with isopentane, in any refrigerant formulation, let alone in a compositions as now claimed.

<u>The '493 Reference has Inconsistent Teachings about the Required Amount of R125</u>

A review of the '493 reference Examples 1-3 and 7 (with corresponding Tables 1-3 and 7) reveal inconsistent teachings about the required amount of R125 in refrigerant formulations to replace R22. In particular, Examples 1-3 calculations would lead the reader to use 61.5% R125 to 73% R125 (with R134a and 4% pentane), while Example 7 performance test data and inventor data analysis (page 7) would clearly lead the reader to use less than 60.5% R125.

Beginning with Examples 1-3, the inventors of the '493 reference formulated compositions to replace R22, and the compositions

> were evaluated using [unidentified] standard refrigeration cycle analysis techniques in order to assess their suitability as retrofit replacements for R22 . . . The pentane was present at 4% by weight based on the total weight of the R125/R134a blend. To simplify the calculation this small amount of pentane was omitted.

See page 6, lines 3-4.

Likewise, the inventors of the '493 reference teach that the compositions having exhaust pressures more than 2 bar above that of R22 were unacceptable (page 7, 2d para., lines 5-6), and compositions having refrigerant capacity less than 90% of that of R22 were unacceptable (page 7, lines 7-8; page 9, lines 7-8; page 10, last paragraph, lines 7-10).

With these criteria, the '493 reference's calculated 'acceptable' compositions had R125 amounts of 64% and 76% (from Examples 2 and 3), and 56%, 64%, and 76% (from

Example 1), even though the Example 1/Table 1 numbers show the calculated capacity of the 56% R125 composition is less than 90% of that of R22. Based on the Example 1-3 calculations, the reader is taught to expect that acceptable performance with compositions (with the 4% pentane added) of 61.5% R125 + 34.5% R134a + 4% pentane and 73% R125 + 23% R134a + 4% pentane. (R125 and R134a amount adjusted to include 4% pentane.)

However, turning to the actual, rather than calculated data, the Table 7 system testing data show that "Blends # 3, 5, and 6 provided the closest similarities to R22 operational temperatures and pressures". *See* page 17, last 2 lines. Yet, Blends # 3, 5, and 6 had R125 amounts of 55%, 45%, and 55% -- all below the 64 wt% indicated by Examples 1-3.

The icing experienced with Blends # 1, 2, and 4 "required addition of up to 20% refrigerant to prevent icing of the evaporator". *See* page 17, line3. Blends # 1, 2 and 4 have R125 amounts of 60.5%, 64%, and 70%, very near the range of R125 that Examples 1, 2, and 3 teach to be acceptable amounts of R125. Thus, Table 7 performance test data teaches away from using compositions having 60.5% or more R125, and teach that the preferred amounts of R125 are in the range of 45-55%; (which is opposite to the teachings of Tables 1-3), to avoid icing problems.

After reading these sections and examples of the '493 reference, one of ordinary skill in the refrigerant formulation field would have learned several things:

(1) that blends matching R22 operational temperatures and pressures did not have the required cooling capacities as calculated by the '493 reference inventors,

(2) if one matches 90% of the R22 cooling capacity, one should expect icing of the evaporator while in operation, or that one must add up to an additional 20% refrigerant to prevent icing, and

(3) one should avoid compositions having 60.5% or higher R125 if seeking an R22 replacement refrigerant mixture.

While achieving 90% of the R22 capacity is taught by the '493 reference to be a minimum requirement in identifying an acceptable blend, nothing in the '493 reference teaches how to formulate a blend with 90% of R22's cooling capacity while achieving the balance of performance properties required for an acceptable R22 alternative. In short, this reference is non-enabling to any invention, let alone the compositions as now claimed.

If the above information from Examples 1, 2, 3, and 7 were not enough to discourage one of ordinary skill from using a composition having more than 55 wt.% of R125 (certainly not more than 60.5 wt%), the other '493 reference Examples (4-6) also teach away from formulating a composition have 62-67 wt % R125. In Examples 4-6 of the '493 reference, various blends were used as an extender refrigerant in systems containing R22, and all examples use compositions having less than 62% R125. While various levels of usefulness as extenders were observed in the different systems, none used isobutane and none used more than 61.5 wt% of R125. *See* page 11 to page 16 (using R125 in amounts of 61.5 wt % and 42.3 wt % R125, and 4% pentane).

In view of the above remarks, withdrawal of the rejection based on the '493 reference is requested.

CONCLUSION

In view of the above amendments and remarks, Applicants respectfully submit that the application and Claims 1 and 22-33, as amended, are in condition for allowance. A Notice of Allowance is earnestly solicited.

Respectfully Submitted,

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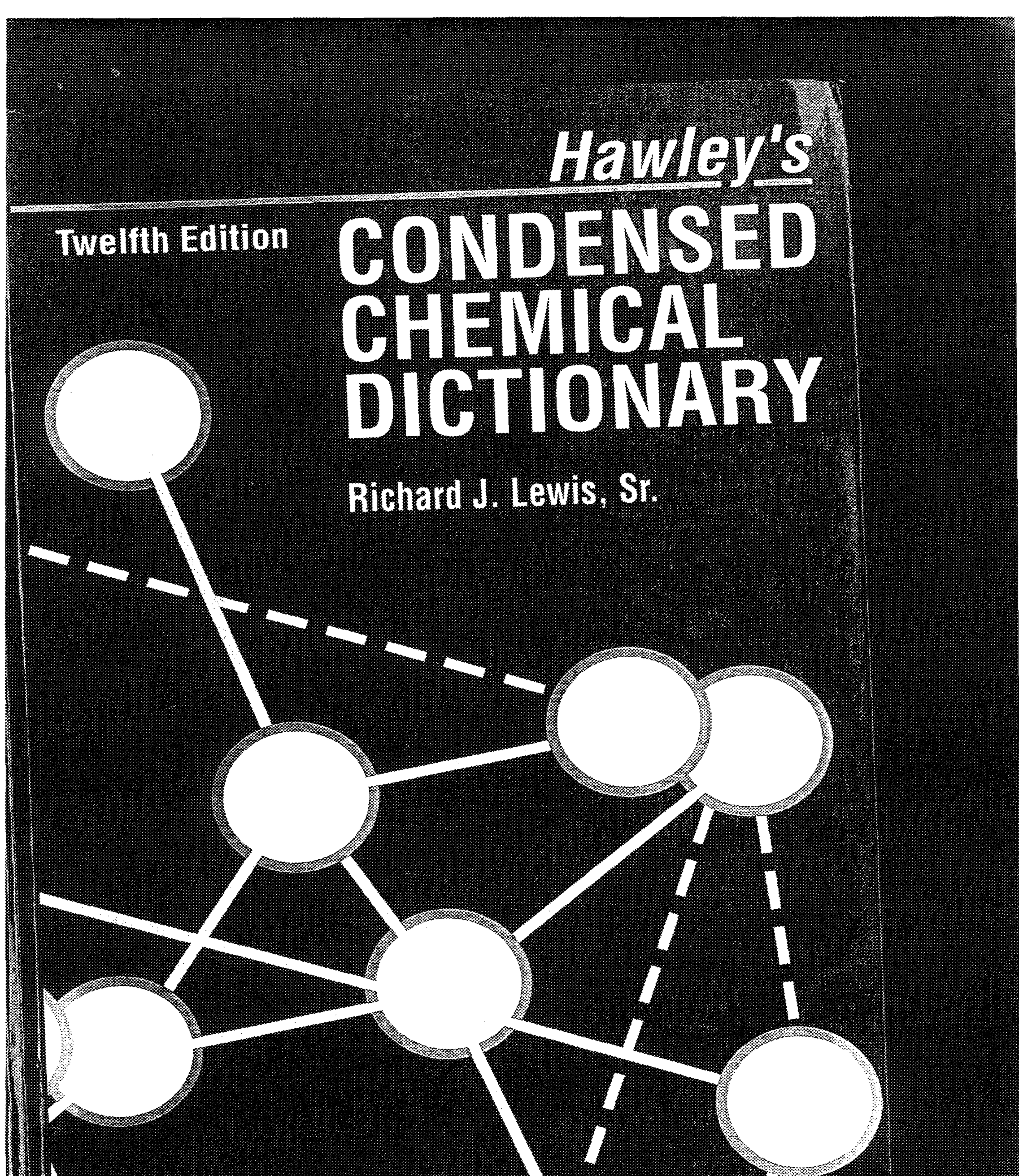
Dated: May 8, 2007

EXHIBIT A

Remarks to February 9, 2007, Office Communication

Application Serial No. 10/530,873

VK-0002 US PCT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acteristics of the reactor nearly constant during use.

burnt lime. See calcium oxide.

burnt sienna. See iron oxide red.

burnt umber. See umber.

"**Buromin**" [*Calgon*]. TM for sodium hexametaphosphate in glass plate form for boiler water conditioning.

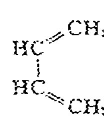
"**Burosil**" [*Calgon*]. TM for a granular, alkaline, phosphate-silicate compound used in boiler-water conditioning to precipitate calcium and magnesium as loose sludge.

burr mill. See attrition mill.

bushy stunt virus. A viral protein present in tomato-plant infections.
Properties: Mw 7,600,000, pH 4.1.
See virus.

"**Butacite**" [*Du Pont*]. TM for polyvinyl butyral resin, available as soft pliable sheeting in 750-ft rolls 10–84 inches wide.
See polyvinyl acetal resins.

1,3-butadiene. (vinylethylene; erythrene; bivinyl; divinyl). CAS: 106-99-0. $H_2C{:}CHHC{:}CH_2$.
37th highest-volume chemical produced in U.S. (1991)



Properties: Colorless gas with mild aromatic odor, easily liquefied, bp −4.41C, d 0.6211 (liquid at 20C), fp −108.9C, flash p −105F (−76C), specific volume 6.9 cu ft/lb (700F), autoign temperture 780F (414C), vap press 17.65 psia (0C). Soluble in alcohol and ether, insoluble in water. The material polymerizes readily, particularly if oxygen is present, and the commercial material contains an inhibitor to prevent spontaneous polymerization during shipment or storage.
Derivation: (1) Catalytic dehydrogenation of butenes or butane; (2) oxidative dehydrogenation of butenes.
Method of purification: Extractive distillation in the presence of furfural, absorption in aqueous cuprous ammonium acetate, or use of acetonitrile.
Grade: Technical (98.0%), CP (99.0%), instrument (99.4%), research (99.8%).
Hazard: Irritant in high concentration. TLV: 10 ppm in air. A suspected human carcinogen. Highly flammable gas or liquid, explosive limits in air 2–11%. May form explosive peroxides on exposure to air. Must be kept inhibited during storage and shipment. Inhibitors often used are di-n-butylamine or phenyl-β-naphthylamine. Storage is usually under pressure or in insulated tanks < 35F (1.67C).
Use: Synthetic elastomers (styrene-butadiene, polybutadiene, neoprene, nitriles), ABS resins, chemical intermediate.

butadiene-acrylonitrile copolymer. See nitrile rubber.

butadiyne. See diacetylene.

butaldehyde. See butyraldehyde.

butanal. See butyraldehyde.

butane. (n-butane). CAS: 106-97-8. $CH_3CH_2CH_2CH_3$.
Properties: Colorless gas, natural-gas odor, extremely stable, has no corrosive action on metals, does not react with moisture, very soluble in water, soluble in alcohol and chloroform, bp −0.5C, fp −138.3C, condensing pressure approximately 30 lb at 32.5C, d (liquid at 0C) 0.599, d (vapor at 0C; air = 1) 2.07, critical temperature 153.2C, critical pressure (absolute) 525 psi, heating value (25C) 3266 Btu/cu ft, specific volume (21.1C), 6.4 cu ft/lb, flash p −76F (−60C), autoign temperature 761F (405C). An asphyxiant gas.
Derivation: A by-product in petroleum refining or gasoline manufacture.
Grade: Research 99.99 mole %, pure 99 mole %, technical 95 mole %, also available in various mixtures with isobutane, propane, pentanes, etc.
Hazard: Highly flammable, dangerous fire and explosion risk. Explosive limits in air 1.9 to 8.5%. TLV: 800 ppm in air. Narcotic in high concentration.
Use: Organic synthesis, raw material for synthetic rubber and high-octane liquid fuels, fuel for household and for many industrial purposes, manufacture of ethylene, solvent, refrigerant, standby and enricher gas, propellant in aerosols, pure grades used in calibrating instruments, food additive.
Note: Butane in liquid form may be stored both above and below ground. Besides storage in liquefied form under its vapor pressure at normal atmospheric temperatures, refrigerated liquid storage at atmospheric pressure may be used. Such systems are closed and insulated, and the liquid petroleum gas vapor is circulated through pumps and compressors to serve as the refriger-